

$\rho(2150)$ $I^G(J^{PC}) = 1^+(1^{--})$

OMITTED FROM SUMMARY TABLE

This entry was previously called $T_1(2190)$. See our mini-review under the $\rho(1700)$.

 $\rho(2150)$ MASS **e^+e^- PRODUCED**

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •			
2254±22	¹ LEES	12G BABR	$e^+e^- \rightarrow \pi^+\pi^-\gamma$
2150±40±50	AUBERT	07AU BABR	$10.6 e^+e^- \rightarrow f_1(1285)\pi^+\pi^-\gamma$
1990±80	AUBERT	07AU BABR	$10.6 e^+e^- \rightarrow \eta'\pi^+\pi^-\gamma$
2153±37	BIAGINI	91 RVUE	$e^+e^- \rightarrow \pi^+\pi^-, K^+K^-$
2110±50	² CLEGG	90 RVUE	$e^+e^- \rightarrow 3(\pi^+\pi^-), 2(\pi^+\pi^-\pi^0)$

NODE=M032

NODE=M032205

NODE=M032M3

NODE=M032M3

OCCUR=2

 $\bar{p}p \rightarrow \pi\pi$

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •			
~2191	HASAN	94 RVUE	$\bar{p}p \rightarrow \pi\pi$
~2070	³ OAKDEN	94 RVUE	0.36–1.55 $\bar{p}p \rightarrow \pi\pi$
~2170	⁴ MARTIN	80B RVUE	
~2100	⁴ MARTIN	80C RVUE	

NODE=M032M1

NODE=M032M1

S-CHANNEL $\bar{N}N$

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •			
2110±35	⁵ ANISOVICH	02 SPEC	$0.6\text{--}1.9 p\bar{p} \rightarrow \omega\pi^0, \omega\eta\pi^0, \pi^+\pi^-$
~2190	⁶ CUTTS	78B CNTR	$0.97\text{--}3 \bar{p}p \rightarrow \bar{N}N$
2155±15	^{6,7} COUPLAND	77 CNTR	$0.7\text{--}2.4 \bar{p}p \rightarrow \bar{p}p$
2193±2	^{6,8} ALSPECTOR	73 CNTR	$\bar{p}p$ S channel
2190±10	⁹ ABRAMS	70 CNTR	S channel $\bar{p}N$

NODE=M032M2

NODE=M032M2

 $\pi^-p \rightarrow \omega\pi^0n$

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
2155±21 OUR AVERAGE			
2140±30	ALDE	95 GAM2	$38 \pi^-p \rightarrow \omega\pi^0n$
2170±30	ALDE	92C GAM4	$100 \pi^-p \rightarrow \omega\pi^0n$

NODE=M032M4

NODE=M032M4

¹ Using the GOUNARIS 68 parametrization of the pion form factor leaving the masses and widths of the $\rho(1450)$, $\rho(1700)$, and $\rho(2150)$ resonances as free parameters of the fit.

² Includes ATKINSON 85.

³ See however KLOET 96 who fit $\pi^+\pi^-$ only and find waves only up to $J = 3$ to be important but not significantly resonant.

⁴ $I(J^P) = 1(1^-)$ from simultaneous analysis of $p\bar{p} \rightarrow \pi^-\pi^+$ and $\pi^0\pi^0$.

⁵ From the combined analysis of ANISOVICH 00J, ANISOVICH 01D, ANISOVICH 01E, and ANISOVICH 02.

⁶ Isospins 0 and 1 not separated.

⁷ From a fit to the total elastic cross section.

⁸ Referred to as T or T region by ALSPECTOR 73.

⁹ Seen as bump in $I = 1$ state. See also COOPER 68. PEASLEE 75 confirm $\bar{p}p$ results of ABRAMS 70, no narrow structure.

NODE=M032M3;LINKAGE=LE

NODE=M032M3;LINKAGE=A

NODE=M032M1;LINKAGE=CC

NODE=M032M;LINKAGE=P

NODE=M032M;LINKAGE=AY

NODE=M032M;LINKAGE=I

NODE=M032M;LINKAGE=E

NODE=M032M;LINKAGE=M

NODE=M032M;LINKAGE=B

 $\rho(2150)$ WIDTH **e^+e^- PRODUCED**

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •			
109±76	¹⁰ LEES	12G BABR	$e^+e^- \rightarrow \pi^+\pi^-\gamma$
350±40±50	AUBERT	07AU BABR	$10.6 e^+e^- \rightarrow f_1(1285)\pi^+\pi^-\gamma$
310±140	AUBERT	07AU BABR	$10.6 e^+e^- \rightarrow \eta'\pi^+\pi^-\gamma$
389±79	BIAGINI	91 RVUE	$e^+e^- \rightarrow \pi^+\pi^-, K^+K^-$
410±100	¹¹ CLEGG	90 RVUE	$e^+e^- \rightarrow 3(\pi^+\pi^-), 2(\pi^+\pi^-\pi^0)$

NODE=M032W3

NODE=M032W3

OCCUR=2

NODE=M032210

$\bar{p}p \rightarrow \pi\pi$

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •			
~ 296	HASAN	94	RVUE $\bar{p}p \rightarrow \pi\pi$
~ 40	12 OAKDEN	94	RVUE 0.36–1.55 $\bar{p}p \rightarrow \pi\pi$
~ 250	13 MARTIN	80B	RVUE
~ 200	13 MARTIN	80C	RVUE

NODE=M032W1

NODE=M032W1

S-CHANNEL $\bar{N}N$

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •			
230±50	14 ANISOVICH	02	SPEC 0.6–1.9 $p\bar{p} \rightarrow \omega\pi^0, \omega\eta\pi^0, \pi^+\pi^-$
135±75	15,16 COUPLAND	77	CNTR 0.7–2.4 $\bar{p}p \rightarrow \bar{p}p$
98±8	16 ALSPECTOR	73	CNTR $\bar{p}p$ S channel
~ 85	17 ABRAMS	70	CNTR S channel $\bar{p}N$

NODE=M032W2

NODE=M032W2

 $\pi^- p \rightarrow \omega\pi^0 n$

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
320±70	ALDE	95	GAM2 38 $\pi^- p \rightarrow \omega\pi^0 n$
• • • We do not use the following data for averages, fits, limits, etc. • • •			
~ 300	ALDE	92C	GAM4 100 $\pi^- p \rightarrow \omega\pi^0 n$

NODE=M032W4

NODE=M032W4

- 10 Using the GOUNARIS 68 parametrization of the pion form factor leaving the masses and widths of the $\rho(1450)$, $\rho(1700)$, and $\rho(2150)$ resonances as free parameters of the fit.
- 11 Includes ATKINSON 85.
- 12 See however KLOET 96 who fit $\pi^+\pi^-$ only and find waves only up to $J = 3$ to be important but not significantly resonant.
- 13 $I(JP) = 1(1^-)$ from simultaneous analysis of $p\bar{p} \rightarrow \pi^-\pi^+$ and $\pi^0\pi^0$.
- 14 From the combined analysis of ANISOVICH 00J, ANISOVICH 01D, ANISOVICH 01E, and ANISOVICH 02.
- 15 From a fit to the total elastic cross section.
- 16 Isospins 0 and 1 not separated.
- 17 Seen as bump in $I = 1$ state. See also COOPER 68. PEASLEE 75 confirm $\bar{p}p$ results of ABRAMS 70, no narrow structure.

NODE=M032W3;LINKAGE=LE

NODE=M032W3;LINKAGE=A
NODE=M032W1;LINKAGE=CCNODE=M032W;LINKAGE=P
NODE=M032W;LINKAGE=AYNODE=M032W;LINKAGE=E
NODE=M032W;LINKAGE=I
NODE=M032W;LINKAGE=B

NODE=M032215;NODE=M032

 $\rho(2150)$ DECAY MODES

Mode	Fraction (Γ_i/Γ)
$\Gamma_1 e^+ e^-$	
$\Gamma_2 \pi^+ \pi^-$	seen
$\Gamma_3 K^+ K^-$	seen
$\Gamma_4 3(\pi^+ \pi^-)$	seen
$\Gamma_5 2(\pi^+ \pi^- \pi^0)$	seen
$\Gamma_6 \eta' \pi^+ \pi^-$	seen
$\Gamma_7 f_1(1285)\pi^+ \pi^-$	seen
$\Gamma_8 \omega\pi^0$	seen
$\Gamma_9 \omega\pi^0\eta$	seen
$\Gamma_{10} p\bar{p}$	

DESIG=1

DESIG=2;OUR EVAL; \rightarrow UNCHECKED \leftarrow
DESIG=3;OUR EVAL; \rightarrow UNCHECKED \leftarrow
DESIG=4;OUR EVAL; \rightarrow UNCHECKED \leftarrow
DESIG=5;OUR EVAL; \rightarrow UNCHECKED \leftarrow
DESIG=6;OUR EVAL; \rightarrow UNCHECKED \leftarrow
DESIG=7;OUR EVAL; \rightarrow UNCHECKED \leftarrow
DESIG=8;OUR EVAL; \rightarrow UNCHECKED \leftarrow
DESIG=9;OUR EVAL; \rightarrow UNCHECKED \leftarrow
DESIG=10

NODE=M032230

NODE=M032G01
NODE=M032G01

NODE=M032G01;LINKAGE=AU

NODE=M032G02
NODE=M032G02

NODE=M032G02;LINKAGE=AU

 $\Gamma(f_1(1285)\pi^+ \pi^-)/\Gamma_{\text{total}} \times \Gamma(e^+ e^-)/\Gamma_{\text{total}}$

VALUE (units 10^{-7})	DOCUMENT ID	TECN	COMMENT
3.1±0.6±0.5	18 AUBERT	07AU BABR	$10.6 e^+ e^- \rightarrow f_1(1285)\pi^+ \pi^- \gamma$

18 Calculated by us from the reported value of cross section at the peak.

 $\Gamma(\eta' \pi^+ \pi^-)/\Gamma_{\text{total}} \times \Gamma(e^+ e^-)/\Gamma_{\text{total}}$

VALUE (units 10^{-8})	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •			
4.9±1.9	19 AUBERT	07AU BABR	$10.6 e^+ e^- \rightarrow \eta' \pi^+ \pi^- \gamma$

19 Calculated by us from the reported value of cross section at the peak.

$\rho(2150)$ REFERENCES

NODE=M032

LEES	12G	PR D86 032013	J.P. Lees <i>et al.</i>	(BABAR Collab.)	REFID=54299
AUBERT	07AU	PR D76 092005	B. Aubert <i>et al.</i>	(BABAR Collab.)	REFID=52049
ANISOVICH	02	PL B542 8	A.V. Anisovich <i>et al.</i>		REFID=48828
ANISOVICH	01D	PL B508 6	A.V. Anisovich <i>et al.</i>		REFID=48327
ANISOVICH	01E	PL B513 281	A.V. Anisovich <i>et al.</i>		REFID=48349
ANISOVICH	00J	PL B491 47	A.V. Anisovich <i>et al.</i>		REFID=47950
KLOET	96	PR D53 6120	W.M. Kloet, F. Myhrer	(RUTG, NORD)	REFID=45212
ALDE	95	ZPHY C66 379	D.M. Alde <i>et al.</i>	(GAMS Collab.) JP	REFID=44371
HASAN	94	PL B334 215	A. Hasan, D.V. Bugg	(LOQM)	REFID=44103
OAKDEN	94	NP A574 731	M.N. Oakden, M.R. Pennington	(DURH)	REFID=45210
ALDE	92C	ZPHY C54 553	D.M. Alde <i>et al.</i>	(BELG, SERP, KEK, LANL+)	REFID=41859
BIAGINI	91	NC 104A 363	M.E. Biagini <i>et al.</i>	(FRAS, PRAG)	REFID=41894
CLEGG	90	ZPHY C45 677	A.B. Clegg, A. Donnachie	(LANC, MCHS)	REFID=41355
ATKINSON	85	ZPHY C29 333	M. Atkinson <i>et al.</i>	(BONN, CERN, GLAS+)	REFID=22000
MARTIN	80B	NP B176 355	B.R. Martin, D. Morgan	(LOUC, RHEL) JP	REFID=21838
MARTIN	80C	NP B169 216	A.D. Martin, M.R. Pennington	(DURH) JP	REFID=21837
CUTTS	78B	PR D17 16	D. Cutts <i>et al.</i>	(STON, WISC)	REFID=21733
COUPLAND	77	PL 71B 460	M. Coupland <i>et al.</i>	(LOQM, RHEL)	REFID=21830
PEASLEE	75	PL 57B 189	D.C. Peaslee <i>et al.</i>	(CANB, BARI, BROW+)	REFID=21824
ALSPECTOR	73	PRL 30 511	J. Alspector <i>et al.</i>	(RUTG, UPNJ)	REFID=21813
ABRAMS	70	PR D1 1917	R.J. Abrams <i>et al.</i>	(BNL)	REFID=21807
COOPER	68	PRL 20 1059	W.A. Cooper <i>et al.</i>	(ANL)	REFID=21805
GOUNARIS	68	PRL 21 244	G.J. Gounaris, J.J. Sakurai		REFID=48054
